every grave complication, it is not these mere elements that are needed—though they indeed are always indispensable—but some broader and superior knowledge, some finer detail of information, some more acute discrimination, some keener analysis of evidence, some more penetrating intellectual vision or more ripened judgment—the fruits of long and serious study, which a whole nation of half-trained persons could not supply; and in the moment of perplexity it is to some quiet scholar or studious thinker that the nation makes appeal; and when he speaks light dawns, the clouds are swept away, and the path of action is made plain. . . .

"The time has gone by when merely individual and local efforts can secure to our country its place among the nations; for we have entered upon a period of world-relations—of world competition, of world policies and of world beneficence—from which it is impossible to recede. Our only hope of great national prosperity lies in the possession of a world-culture that will place us on a level with the best thought and highest knowledge attainable by man. Every humblest toiler on the farm and in the factory will henceforth be affected by the discoveries of science, the movements of foreign commerce and the resources of national industry. We have won our present industrial pre-eminence, without the advantages of technical education, through the fertility of our soil and a native genius for construction and organisation; but the time must come, and it may not be far distant, when the highest technical education will be necessary to the success of the simplest American industry. The competition of the hand is rapidly resolving itself into the competition of the brain, and the comprehension, guidance and application of natural forces in accordance with natural laws become questions of national consequence.

"Give us, then, O learned doctors, more discoveries of science, for we know not what new revelations may yet burst forth from your laboratories; give us more of art, for it is only through the channels of expression by word and sign and symbol that new truth can be lodged in the minds of the people; give us more of history, for it is only by conning the lessons of experience that the children of men grow wiser; give us more of literature, for it is only through the life of letters that man rises to the full comprehension of himself; give us more of ethics and philosophy, for it is only in the light of great principles that character becomes firm and conduct noble; let earth, and sea, and sky, and the stars in their courses, the long struggle of man and the story of his aspirations, the tongues of the busy day and the silence of the voiceless night, the instincts that stir us to passion and the still small voice that drops its calm out of eternity, all teach us the ways of creation and the mystery of our divine descent; for it is through the totality of their culture that nations rise, and through ignorance or defiance of unbending laws that nations fall."

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Dr. G. C. Bourne has been appointed to represent the University on the Board of Governors of Coopers Hill College.

The seventh Robert Boyle lecture will be delivered by Prof. Sylvanus Thompson on June 6; the subject will be "Magnetism in Growth."

Mr. H. B. Hartley, scholar of Balliol College, has been elected to a fellowship at that college as science tutor in succession to the late Sir John Conroy. Mr. Hartley obtained a first class in chemistry and mineralogy in 1900.

CAMBRIDGE.—Sir W. Martin Conway has been elected Slade professor of fine art in succession to Dr. Waldstein.

Seventy three men and twenty-six women have acquitted themselves so as to deserve mathematical honours in the first part of the tripos.

It is proposed to appropriate from the Benefaction Fund a sum of 21,000*l.* to the new botany school building, and 16,000*l.*, together with some 5500*l.* specially contributed, to the new medical school building.

Prof. Macalister is appointed an examiner in anatomy for medical degrees in the place of Dr. Barclay-Smith.

THE field studies in natural history arranged by Mr. David Houston for the Essex Technical Instruction Committee provide an excellent means of becoming familiar with nature, and should be of special assistance to teachers who desire to adopt the scheme of nature study recently issued for rural schools by the Board of Education. Rambles are arranged for Saturday afternoons, and demonstrations in general natural history are given by the director, so that an introductory knowledge of the natural vegetation of the county can be obtained in a pleasant way. A ten days' vacation course has been arranged to be held in the New Forest, from August 12 to 22. The programme of the course, and the field notes appended to it, show that the members of the party will have the opportunity of spending a profitable short holiday in the New Forest and neighbourhood.

APPROVAL of the Government Education Bill has been expressed by several educational bodies concerned with technical and secondary education. The chief difficulties raised by the Bill relate to the constitution of the local authorities to be responsible for the educational work of their respective districts, and the funds which are to be available for technical and secondary education. At present technical instruction committees administer the "whisky money," and in a few places an additional penny rate is also levied. The new Bill proposes to let the local authority administer these funds, and to give it the power to levy another penny rate; but as the funds are to be used for both secondary and technical education, the extension of rating power is wholly inadequate to the requirements. This view is held by the council of the Association of Technical Institutions, and in order to give expression to it a special meeting of the Association will shortly be held. Resolutions will be brought forward to the effect that, while the general principles of the Bill are approved, adequate provision must be made to defray the necessary additional charges in respect of secondary education which will fall upon the local authorities, and technical instruction must be provided for before the residue available under the Local Taxation (Customs and Excise) Act is used for purposes of secondary education in general.

SCIENTIFIC SERIALS.

Annalen der Physik, May.—Researches on the normal cell, especially the Weston element, by W. Jaeger and St. Lindeck. This paper contains the results of an exhaustive experimental study of the Clark and Weston cells. The researches of E. Cohen had thrown some doubts upon the suitability of the Weston cell as a standard, especially in the neighbourhood of 0° C. In the present paper it is shown that these irregularities only occur about 0° C. and with the cell containing 14·3 per cent. amalgam, no trace of any irregular deviations appearing when the cell is used at 10° C. or higher temperatures. Further, if the amalgam is made slightly weaker in cadmium, 12 per cent. or 13 per cent., these irregularities near 0° disappear, and the measurements are trustworthy at all temperatures. It is concluded that the strictures of Cohen with regard to this cell are not justified, and that the Weston element is eminently suitable as a standard of electromotive force.—The calculation of isotherms, by C. Dieterici. The fundamental equation of condition of van der Waals is modified, in part empirically, without assuming that the cohesion pressure and the volume correction are determined, and the results applied to the measurements of Young on isopentane and benzene, of Ramsay and Young on ether and water, and of Cailletet and Matthias on sulphur dioxide and carbonic acid.—Contribution to the theory of electric discharges in gases, by J. Stark.—On the variation of the dielectric constant with pressure and temperature, by J. Koenigsberger.—The constancy of the sparking potential, by K. R. Johnson.—On Jaumann's clear J-surface, by A. Korn. A discussion of a phenomenon first observed by Jaumann in a vacuum tube.—The internal friction of argon and its variation with temperature, by H. Schultze. The absolute value found for the viscosity coefficient of argon is practically identical with that previously determined by Lord Rayleigh, but the alteration of viscosity with temperature is found to be somewhat greater according to the author's experiments. The formula suggested by Sutherland gives a good approximation to the results of the experiments.—On the internal friction of gases and its change with the temperature, by P. Breitenbach. An application of Sutherland's formula to the experiments previously published by the author on the temperature coefficient of the viscosity of air, ethylene, carbonic acid, hydrogen and methyl chloride. The agreement between the calculated and experimental results is so good as to amount to a proof of Sutherland's theory.—The equilibrium

figures of powders, by F. Auerbach.—On the influence of temperature on the elasticity of metals, by C. Schaefer. Experiments were carried out on nine metals, and the value of the torsion modulus measured at – 186° C., – 70° C. and about 20° C. If the temperature coefficients of the different metals are plotted as ordinates, and the melting points as abscissæ, a smooth curve passes through the whole of the results.—Remarks on a paper of T. Middel on the cause of the thermal change of delicacy in balances, by W. Felgentraeger.—Liquid crystals, by O. Lehmann. A reply to some remarks of G. Tammann.—On the distribution of electricity on an ellipsoid, by G. Jaeger.

Symons's Meteorological Magazine for May contains a useful reference table of the annual means and extremes of the meteorological observations taken at Camden Square for each of the forty years 1858–97. During the years 1898 and 1899 Mr. Symons gave for each month the means and extremes for the various elements, and the present third set of tables completes this unique and valuable record of the climate of London. It may not be out of place to quote a few of the extreme values of the period in question, which are shown by a glance at the table, although we have referred to most of them on former occasions. The highest solar radiation temperature (since 1870) was 137°·7 in 1881, and the lowest terrestrial radiation temperatures (since 1860) were 0°·6 in the same year and 0°·5 in 1867. The extremes in the screen were 94°·6 in 1881 and 6°·7 in 1867. The same low reading occurred in 1860, and 7°·3 in the severe frost of 1895. The greatest rainfall (34·08 inches) occurred in 1878, and the least (16·93 inches) in 1864.

SOCIETIES AND ACADEMIES.

LONDON

Anthropological Institute, May 14.—Mr. R. Shelford, of Sarawak, exhibited a number of carved bamboos and commented on the elements of Dyak decorative art.—Mr. W. MacDougall read a paper by Dr. Hose and himself on the animal cults of Sarawak. He showed that though many of them exhibit elements frequently associated with totemism, such as the respect paid to an animal believed to be the resting-place of the soul of a deceased ancestor, totemism itself could not be regarded as the starting-point of any of the cults, and was at most only present in a rudimentary stage. He also gave details as to the beliefs of the Sea Dyaks about the Nyarong or spirit-helper believed to be acquired by some men in dreams.

EDINBURGH.

Royal Society, May 8.—Dr. Burgess in the chair.—Prof. Copeland and Dr. J. Halm, in further notes on the new star in Perseus, gave a description of the changes which had accompanied the star's decrease in brightness. One of the most interesting features was the periodicity which had recently established itself, indicating a period of three to five days with a possible longer period of several weeks. The corresponding changes in the spectrum were also discussed, the apparent shifting of certain bands being explained as due to the fading of the one and the relative brightening of the other of two overlapping bands. Broadly speaking, the change in the spectrum had been towards the nebular type. It was suggested that the absorption bands flanking the bright bands were an effect of high internal pressure.—Prof. John Gibson read a paper on certain relations between the electrical conductivity and the chemical character of solutions, following up a previous communication published three years ago. The paper was based upon a large number of experiments, some of which had been going on for years and were not yet completed. The broad principle underlying the results he had obtained was that in solutions inter-molecular reactions tend towards maximum specific electrical conductivity. In one series of experiments solutions of hydrochloric acid of varying concentration were formed and a small proportionate quantity of chromic anhydride added to each. In strong solutions above the concentration which gives the maximum specific conductivity, the reaction, represented by the equation $12HCl + 2CrO_3 = 2CrCl_3 + 6H_2O + 3Cl_2$ and indicated to the eye by the change in colour, went on more rapidly the further removed the concentration was from that which corresponds to the maximum specific conductivity. In one experiment the critical concentration of 18·2 per cent. was used and the mixture kept in the dark. The reaction is not yet complete, although three years have elapsed. With a 20 per cent. solution the reaction was completed in about six months, and with a 24 per cent. solution in less than one month. Similar results were obtained with other solutions involving more rapid reactions, requiring for their completion times comprised within a small number of weeks or even minutes. In the case of sugar solutions another determining factor came in, namely, the viscosity, a diminution in which by the destruction of the sugar by sulphuric acid increases the conductivity independently of change in concentration. An interesting illustration of the same principle was afforded by the fact that in vinous fermentation a greater concentration than about 14 per cent. cannot be obtained. By making a series of artificial musts with proper proportions of salts, sugar and alcohol so as to represent approximately successive stages of the fermentation, Dr. Gibson found that the conductivity approached a maximum as the concentration of alcohol approached 14 per cent. The paper ended with a novel and interesting discussion of the phenomena of plant life along the same broad physico-chemical lines. The *rôle* of the inorganic salts necessarily present in the sap, the special usefulness of certain salts and the influence of varying concentration were discussed and connected with principles in regard to photochemical action and chemical action generally embodied in two short papers read in 1897 and published in the Society's *Proceedings*.—Prof. George Forbes, F.R.S., read an additional note on the Ultra-Neptunian planet the existence of which is indicated by its action on comets, supplementing papers on the same subject published twenty years ago. The general idea was that comets were attracted into the solar system by the action of outlying planets; and there were seven comets having aphelion positions corresponding with positions of a planet revolving round the sun at a distance 100 times that of the earth, with a period of about 1000 years. It was suggested that this planet, by its disturbing action on the comet of 1264 and 1556, which had not reappeared as expected in 1848, had so altered the elements of the orbit as to make it no longer recognisable; and reasons were given in favour of the identification of the lost comet with either the comet 1844 (3) or the comet 1843 (2), both of which had parabolic orbits assigned. If these were assumed to be ellipses of the proper size the aphelion positions would not be far removed from the positions occupied by the supposed planet. To produce the changes demanded in the orbit the mass of the supposed planet would, however, require to be greater than that of Jupiter.

PARIS.

Academy of Sciences, May 20.—M. Fouqué in the chair.—On the total eclipse of May 18, by M. J. Janssen. A short report on observations of the recent eclipse by M. de la Baume, at Sumatra. The rotation of the sun's corona, and the presence of Fraunhofer's lines in the light thereof, have not been confirmed.—Researches on the condition of alumina in soils, by M. T. Schlœsing. A number of specimens of earth from Madagascar were found to contain considerable quantities of alumina, either in the free state or in the form of a silicate readily attacked by dilute caustic soda solution. The greater part of the alumina or the silicate exists in a pulverulent, sandy state, and is not the cause of the tenacity of the soil; it has no adverse influence on vegetation.—M. Laveran was elected to fill the vacancy in the Section of Medicine and Surgery caused by the decease of M. Potain.—On the eclipse of Jupiter's fourth satellite, observed at Paris, May 17, 1901, by M. G. Bigourdan.—Observations of the brightness of Nova Persei, by M. Luizet. The variations in the brightness of this star are said to show no regular periodicity.—On regular groups of a finite order, by M. Léon Autonne.—On the molecular depressions of the temperature of maximum density of water produced by the dissolution of the chlorides, bromides and iodides of potassium, sodium, rubidium, lithium and ammonium; the relations between these depressions, by M. L. C. de Coppet. The experimental results are given in tabular form. The lowering of the temperature of maximum density is proportional to the quantity of salt dissolved, whilst the *molecular* lowering is almost constant. Lithium salts, however, are an exception to the latter rule, their molecular lowering increasing with the concentration. The salts of sodium are the most, and those of lithium the least, active. Iodides produce a greater depression than bromides, and bromides than chlorides, the relations between the observed values being the same for all the metals of the group.—Alcohols and calcium carbide, by M. Pierre Lefebvre. A continuation of previous work on the